Author Index

Ahlich, K. & Sieber, T. N., The profusion of dark septate endophytic fungi in non-ectomycorrhizal fine roots of forest trees and shrubs, 259

Ahonen, T. (see Vesala, T.), 235

Alexander, I. J. (see Su See, L.), 297

Ali, A. H. (see Al Kubisi, A.), 313

Al Kubisi, A., Ali, A. H. & Hipkin, C. R., Nitrite assimilation by the yeast *Candida nitratophila*, 313

Amzallag, G. N., Transmissible reproductive changes following physiological adaptation to salinity in *Sorghum bicolor*, 317

Anttonen, S. (see Booker, F. L.), 483

Armstrong, R. A. & Smith, S. N., Experimental studies of hypothallus growth in the lichen *Rhizocarpon geographicum*, 123

Ascaso, C. (see Balaguer, L.), 641

Ash, J. E. (see García-Guzmán, G.), 459

Ashenden, T. (see Pearson, S.), 493

Assunta Lo Gullo, M. (see Salleo, S.), 47

Badger, M. R. (see Palmqvist, K.), 627

Baker, A. J. M. (see Pollard, A. J.), 113

Balaguer, L., Valladares, F., Ascaso, C., Barnes, J. D., de los Rios, A., Manrique, E. & Smith, E. C., Potential effects of rising tropospheric concentrations of CO_2 and O_3 on green-algal lichens, 641

Balls, G. R., Palmer-Brown, D. & Sanders, G. E., Investigating microclimatic influences on ozone injury in clover (*Trifolium subterraneum*) using artificial neural networks, 271

Barnes, J. D. (see Balaguer, L.), 641

Bates, J. W., McNee, P. J. & McLeod, A. R., Effects of sulphur dioxide and ozone on lichen colonization of conifers in the Liphook Forest Fumigation Project, 653

Bennett, K. D., Determination of the number of zones in a biostratigraphical sequence, 155

Bermingham, S., Maltby, L. & Dewey, F. M., Monoclonal antibodies as tools to quantify mycelium of aquatic hyphomycetes, 593

Bonser, A. M., Lynch, J. & Snapp, S., Effect of phosphorus deficiency on growth angle of basal roots in *Phaseolus vulgaris*, 281

Booker, F. L., Anttonen, S. & Heagle, A. S., Catechin, proanthocyanidin and lignin contents of loblolly pine (*Pinus taeda*) needles after chronic exposure to ozone, 483

Botton, B. (see Lorillou, S.), 289

Bowler, J. M. & Press, M. C., Effects of elevated CO_2, nitrogen form and concentration on growth and photosynthesis of a fast- and slow-growing grass, 391

Burdon, J. J. (see García-Guzmán, G.), 459

Carfagna, S. (see Rigano, C.), 375

Carillo, P. (see Rigano, C.), 375

Chatterton, N. J. (see Ernst, M.), 63

Crittenden, P. D. (see Hyvärinen, M.), 521

Cunningham, R. B. (see García-Guzmán, G.), 459

Davison, A. W. (see Pearson, S.), 493

de los Rios, A. (see Balaguer, L.), 641

De Paoli, D. (see Salleo, S.), 47

Dewey, F. M. (see Bermingham, S.), 593

Dighton, J. (see Gray, S. N.), 471

Di Martino Rigano, V. (see Rigano, C.), 375

Drevon, J.-J. (see Ribet, J.), 383

Duckett, J. G. (see Ligrone, R.), 603

El-Keblawy, A. A., Shaltout, K. H., Lovett Doust, J. & Lovett Doust, L., Maternal effects on progeny in *Thymelaea hirsuta*, 77

Ernst, D. (see Schnitzler, J.-P.), 247

Ernst, M., Chatterton, N. J. & Harrison, P. A., Purification and characterization of a new fructan series from species of Asteraceae, 63

Esposito, S. (see Rigano, C.), 375

Fay, P. (see Jongen, M.), 413

——, Mitchell, D. T., Osborne, B. A., Photosynthesis and nutrient-use efficiency of barley in response to low arbuscular mycorrhizal colonization and addition of phosphorus, 425

Fisher, P. J., Survival and spread of the endophyte *Stagonospora pteridiicola* in *Pteridium aquilinum*, other ferns and some flowering plants, 119

Fitter, A. (see Merryweather, J.), 307

Fossitt, J. A., Late Quaternary vegetation history of the Western Isles of Scotland, 171

Frey, B., Scheidegger, C., Günthardt-Goerg, M. S. & Matyssek, R., The effects of ozone and nutrient supply on stomatal response in birch (*Betula pendula*) leaves as determined by digital image-analysis and X-ray microanalysis, 135

Friess, N. & Maillet, J., Influence of cucumber mosaic virus infection on the intraspecific competitive ability and fitness of purslane (*Portulaca oleracea*), 103

Führer, H.-W. (see Slovik, S.), 661

García-Guzmán, G., Burdon, J. J., Ash, J. E. & Cunningham, R. B., Regional and local patterns in the spatial distribution of the flower-infecting smut fungus *Sporisorium amphilophis* in natural populations of its host *Bothriochloa macra*, 459

Gray, S. N., Dighton, J. & Jennings, D. H., The physiology of basidiomycete linear organs. III. Uptake and translocation of radiocaesium within differentiated mycelia of *Armillaria* spp. growing in microcosms and in the field, 471

Günthardt-Goerg, M. S. (see Frey, B.), 135

Hall, L. N. & Langdale, J. A., Tansley Review No. 88. Molecular genetics of cellular differentiation in leaves, 533

Hari, P. (see Vesala, T.), 235

Harrison, P. A. (see Ernst, M.), 63

Hay, M. J. M. & Sackville Hamilton, N. R., Influence of xylem vascular architecture on the translocation of phosphorus from nodal roots in a genotype of *Trifolium repens* during undisturbed growth, 575

Heagle, A. S. (see Booker, F. L.), 483

Heber, U. (see Slovik, S.), 661

Heinzmann, U. (see Schnitzler, J.-P.), 247

Heller, W. (see Schnitzler, J.-P.), 247

Hipkin, C. R. (see Al Kubisi, A.), 313

Holopainen, T. (see Pääkkönen, E.), 145

Horsten, P. J. F. M. (see Kempenaar, C.), 453

Hutzler, P. (see Schnitzler, J.-P.), 247

Hyvärinen, M. & Crittenden, P. D., Cation ratios in *Cladonia portentosa* as indices of precipitation acidity in the British Isles, 521

Ince, J., Late-glacial and early Holocene vegetation of Snowdonia, 343

Jakobsen, I. (see Larsen, J.), 127

Jennings, D. H. (see Gray, S. N.), 471

Jingxian Zhang, & Kirkham, M. B., Antioxidant responses to drought in sunflower and sorghum seedlings, 361

Jones, M. B. (see Jongen, M.), 413

Jongen, M., Fay, P. & Jones, M. B., Effects of elevated carbon dioxide and arbuscular mycorrhizal infection on *Trifolium repens*, 413

Jungblut, T. P. (see Schnitzler, J.-P.), 247

Kameli, A. & Lösel, D. M., Growth and sugar accumulation in durum wheat plants under water stress, 57

Kärenlampi, L. (see Pääkkönen, E.), 145

Kempenaar, C., Horsten, P. J. F. M. & Scheepens, P. C., Effects of *Ascochyta caulina* on photosynthesis of leaves of *Chenopodium album*, 453

King, R. J. (see Mostaert, A. S.), 513

Kirkham, M. B. (see Jingxian Zhang,), 361

Koelewijn, H. P. & Van Damme, J. M. M., Gender variation, partial male sterility and labile sex expression in gynodioecious *Plantago coronopus*, 67

Köfferlein, M. (see Schnitzler, J.-P.), 247

Krissinel, E. (see Vesala, T.), 235

Lambers, H. (see Raaimakers, D.), 97

LANGDALE, J. A. (see HALL, L. N.), 533
LANGEBARTELS, C. (see SCHNITZLER, J.-P.), 247
LARSEN, J., THINGSTRUP, I., JAKOBSEN, I. & ROSENDAHL, S., Benomyl inhibits phosphorus transport but not fungal alkaline phosphatase activity in a *Glomus*–cucumber symbiosis, 127
LEAKE, J. R. & MILES, W., Phosphodiesters as mycorrhizal P sources. I. Phosphodiesterase production and the utilization of DNA as a phosphorus source by the ericoid mycorrhizal fungus *Hymenoscyphus ericae*, 435
——, (see MYERS, M. D.), 445
LIGRONE, R. & DUCKETT, J. G., Development of water-conducting cells in the antipodal liverwort *Symphyogyna brasiliensis* (Metzgeriales), 603
LORILLOU, S., BOTTON, B. & MARTIN, F., Nitrogen source regulates the biosynthesis of NADP-glutamate dehydrogenase in the ectomycorrhizal basidiomycete *Laccaria bicolor*, 289
LÖSEL, D. M. (see KAMELI, A.), 57
LOVETT DOUST, J. (see EL-KEBLAWY, A. A.), 77
LOVETT DOUST, L. (see EL-KEBLAWY, A. A.), 77
LYNCH, J. (see BONSER, A. M.), 281
MAILLET, J. (see FRIESS, N.), 103
MALTBY, L. (see BERMINGHAM, S.), 593
MANRIQUE, E. (see BALAGUER, L.), 641
MARAÑÓN, T. (see ROMERO, J. M.), 565
MARRIOTT, C. A. & ZUAZUA, M. T., Tillering and partitioning of dry matter and nutrients in *Lolium perenne* growing with neighbours of different species: effects of nutrient supply and defoliation, 87
MARTIN, F. (see LORILLOU, S.), 289
MATYSSEK, R. (see FREY, B.), 135
MCLEOD, A. R. (see BATES, J. W.), 653
MCNEE, P. J. (see BATES, J. W.), 653
MERRYWEATHER, J. & FITTER, A., Phosphorus nutrition of an obligately mycorrhizal plant treated with the fungicide benomyl in the field, 307
METSÄRINNE, S. (see PÄÄKKÖNEN, E.), 145
MILES, W. (see LEAKE, J. R.), 435
MINTIENS, A. (see VAN DEN ENDE, W.), 555
MITCHELL, D. T. (see FAY, P.), 425
MOSTAERT, A. S., ORLOVICH, D. A. & KING, R. J., Ion compartmentation in the red alga *Caloglossa leprieurii* in response to salinity changes: freeze-substitution and X-ray microanalysis, 513
MYERS, M. D. & LEAKE, J. R., Phosphodiesters as mycorrhizal P sources. II. Ericoid mycorrhiza and the utilization of nuclei as a phosphorus and nitrogen source by *Vaccinium macrocarpon*, 445
NEWBERY, R. M. & WOLFENDEN, J., Effects of elevated CO_2 and nutrient supply on the seasonal growth and morphology of *Agrostis capillaris*, 403
NIVALA, V. (see SUTINEN, M.-L.), 503
OLLERENSHAW, J. H. (see PEARSON, S.), 493
OLLIKAINEN, R. (see SUTINEN, M.-L.), 503
ONUOHA, A. A. (see VAN DEN ENDE, W.), 555
ORLOVICH, D. A. (see MOSTAERT, A. S.), 513
OSBORNE, B. A. (see FAY, P.), 425
PÄÄKKÖNEN, E., METSÄRINNE, S., HOLOPAINEN, T. & KÄRENLAMPI, L., The ozone sensitivity of birch (*Betula pendula*) in relation to the developmental stage of leaves, 145
PALMER-BROWN, D. (see BALLS, G. R.), 271
PALMQVIST, K. & BADGER, M. R., Carbonic anhydrase(s) associated with lichens: *in vivo* activities, possible locations and putative roles, 627
PARDOE, H. S., Micro-scale patterns of modern pollen deposition within three alpine plant communities, 327
PARSONS, R. (see SILVESTER, W. B.), 617
PEARCE, R. B., Tansley Review No. 87. Antimicrobial defences in the wood of living trees, 203
PEARSON, S., DAVISON, A. W., REILING, K., ASHENDEN, T. & OLLERENSHAW, J. H., The effects of different ozone exposures on three contrasting populations of *Plantago major*, 493
POLLARD, A. J. & BAKER, A. J. M., Quantitative genetics of zinc hyperaccumulation in *Thlaspi caerulescens*, 113
PRESS, M. C. (see BOWLER, J. M.), 391
RAAIMAKERS, D. & LAMBERS, H., Response to phosphorus supply of tropical tree seedlings: a comparison between a pioneer species *Tapirira obtusa* and a climax species *Lecythis corrugata*, 97
RAITIO, H. (see SUTINEN, M.-L.), 503
REILING, K. (see PEARSON, S.), 493
RIBET, J. & DREVON, J.-J., The phosphorus requirement of N_2-fixing and urea-fed *Acacia mangium*, 383
RIGANO, C., DI MARTINO RIGANO, V., VONA, V., CARFAGNA, S., CARILLO, P. & ESPOSITO, S., Ammonium assimilation by young plants of *Hordeum vulgare* in light and darkness: effects on respiratory oxygen consumption by roots, 375
RITARI, A. (see SUTINEN, M.-L.), 503
ROMERO, J. M. & MARAÑÓN, T., Allocation of biomass and mineral elements in *Melilotus segetalis* (annual sweetclover): effects of NaCl salinity and plant age, 565
ROSENDAHL, S. (see LARSEN, J.), 127
SACKVILLE HAMILTON, N. R. (see HAY, M. J. M.), 575
SALLEO, S., ASSUNTA LO GULLO, M., DE PAOLI, D. & ZIPPO, M., Xylem recovery from cavitation-induced embolism in young plants of *Laurus nobilis*: a possible mechanism, 47
SANDERMANN, H., Jr (see SCHNITZLER, J.-P.), 247
SANDERS, G. E. (see BALLS, G. R.), 271
SCHEEPENS, P. C. (see KEMPENAAR, C.), 453
SCHEIDEGGER, C. (see FREY, B.), 135
SCHMELZER, E. (see SCHNITZLER, J.-P.), 247
SCHNITZLER, J.-P., JUNGBLUT, T. P., HELLER, W., KÖFFERLEIN, M., HUTZLER, P., HEINZMANN, U., SCHMELZER, E., ERNST, D., LANGEBARTELS, C. & SANDERMANN, H., Jr, Tissue localization of u.v.-B-screening pigments and of chalcone synthase mRNA in needles of Scots pine seedlings, 247
SCOTT, E. S. (see SUKARNO, N.), 583
SHALTOUT, K. H. (see EL-KEBLAWY, A. A.), 77
SHOKHIREV, N. (see VESALA, T.), 235
SIEBER, T. N. (see AHLICH, K.), 259
SIEGMUND, A. (see SLOVIK, S.), 661
SILVESTER, W. B., PARSONS, R. & WATT, P. W., Direct measurement of release and assimilation of ammonia in the *Gunnera–Nostoc* symbiosis, 617
SLOVIK, S., SIEGMUND, A., FÜHRER, H.-W. & HEBER, U., Stomatal uptake of SO_2, NO_x and O_3 by spruce crowns (*Picea abies*) and canopy damage in central Europe, 661
SMITH, C. J., Tansley Review No. 86. Accumulation of phytoalexins: defence mechanism and stimulus response system, 1
SMITH, E. C. (see BALAGUER, L.), 641
SMITH, F. A. (see SUKARNO, N.), 583
SMITH, S. E. (see SUKARNO, N.), 583
SMITH, S. N. (see ARMSTRONG, R. A.), 123
SNAPP, S. (see BONSER, A. M.), 281
SPELEERS, H. (see VAN DEN ENDE, W.), 555
SUKARNO, N., SMITH, F. A., SMITH, S. E. & SCOTT, E. S., The effect of fungicides on vesicular–arbuscular mycorrhizal symbiosis. II. The effects on area of interface and efficiency of P uptake and transfer to plant, 583
SU SEE, L. & ALEXANDER, I. J., The dynamics of ectomycorrhizal infection of *Shorea leprosula* seedlings in Malaysian rain forests, 297
SUTINEN, M.-L., RAITIO, H., NIVALA, V., OLLIKAINEN, R. & RITARI, A., Effects of emissions from copper-nickel smelters on the frost hardiness of *Pinus sylvestris* needles in the subarctic region, 503
THINGSTRUP, I. (see LARSEN, J.), 127
VALLADARES, F. (see BALAGUER, L.), 641
VAN DAMME, J. M. M. (see KOELEWIJN, H. P.), 67
VAN DEN ENDE, W., MINTIENS, A., SPELEERS, H., ONUOHA, A. A. & VAN LAERE, A., The metabolism of fructans in roots of *Cichorium intybus* during growth, storage and forcing, 555
VAN LAERE, A. (see VAN DEN ENDE, W.), 555
VESALA, T., AHONEN, T., HARI, P., KRISSINEL, E. & SHOKHIREV, N., Analysis of stomatal CO_2 uptake by a three-dimensional cylindrically symmetric model, 235
VONA, V. (see RIGANO, C.), 375
WATT, P. W. (see SILVESTER, W. B.), 617
WOLFENDEN, J. (see NEWBERY, R. M.), 403
ZIPPO, M. (see SALLEO, S.), 47
ZUAZUA, M. T. (see MARRIOTT, C. A.), 87

Subject Index

Acacia, 383
Acid rain, 521
Acquired characters, 317
Agrostis capillaris, 391, 403
Air pollution, 503
Air pollution (SO_2, NO_x, O_3), 661
Alatospora acuminata, 593
Alkaline phosphatase, 127
Allium cepa, 583
Allocation, 565
Alpine, 327
Ammonia, 617
Ammonium, 313, 391
Ammonium assimilation, 375
Antimicrobial defence, 203
Antioxidants, 361
Arbuscular mycorrhiza, 127
Arbuscular mycorrhizal fungi, 307
Areolae, 123
Armillaria gallica, 471
Armillaria ostoyae, 471
Artificial neural networks, 271
Ascochyta caulina, 453
Asparagine, 617
Auto-radiography, 471
Barley, 425
Basal roots, 281
Benomyl, 127, 307
Betula pendula, 135, 145
Biological weed control, 453
Biostratigraphy, 155
Blanket peat, 171
Bothriochloa macra, 459
Bradyrhizobium, 383
Caloglossa, 513
Candida nitratophila, 313
Carbohydrate transfer, 123
Carbohydrates, 413
Carbon deficiency, 313
Carbon-concentrating mechanism (CCM), 627
Carbonic anhydrase, 627
Catechin, 483
Cations, 521
Cellular differentiation, 533
Cellular morphogenesis and cortical microtubules, 603
Chenopodium album (common lambsquarters), 453
Cichorium intybus, 63
Cichorium intybus (chicory), 555
Cladonia portentosa, 521
C:N ratio, 413
CO_2 concentration profile, 235
CO_2 exchange, 235
Competition, 459
Competitive ability, 103
Conifer bark, 653
Correlation, 155
Cryptosporiopsis radicicola, 259
Cucumber mosaic virus, 103
Cyclic nucleotides, 1
Dark septate endophytic fungi, 259
Decay, 203
Density-dependence, 459
Diffusion, 235
Dipterocarps, 297
Disease resistance, 203
Distribution and growth, 97
Drought, 361
Dry deposition (stomatal uptake of trace gases), 661
Ectomycorrhizal fungus, 289
Ectomycorrhizas, 297
Elevated CO_2, 403, 413, 641
Elevated O_3, 641
Elicitors, 1
Endophytes, 119
Environmental change, 343
Epidermal layer, 247
Exonuclease, 435
Forest decline, 661
Forest-tree fine roots, 259
Freeze-substitution, 513
Frost hardiness, 503
Fructan, 63, 555
Fungi, 593
Fungicide, 307, 583
Gender strategy, 67
Genotype–environment interaction, 77
Glomus mosseae, 413, 425
Glomus sp. 'City Beach', 583
Glutamine, 375
Golgi bodies, 603
Growth, 57
Growth and morphology, 403
Gunnera, 617
Gynodioecy, 67
Heathland, 521
Heavy metals, 503
Helianthus annuus, 361
Helianthus tuberosus, 63
Heritability, 113
Holocene, 171
Hordeum vulgare (barley), 375
Hormones, 47
Hyacinthoides non-scripta (bluebell), 307
Hyperaccumulation, 113
Hyphal P transport, 127
Hypothallus, 123
Immunochemistry, 593
In situ hybridization, 247
Infection dynamics, 297
Inter-specific competition, 87
Inulin, 555
Inulo-*n*-ose, 63
Invertase, 555
Ion compartmentation, 513
Juniper, 343
Labile sex expression, 67
Laccaria bicolor, 289
Late glacial, 171
Late-glacial, 343
Laurus nobilis L. (Laurel), 47
Leaf development, 533
Leaf developmental stage, 145
Lecythis corrugata Poit., 97
Lichen, 123, 521, 627
Lichens, 641, 653
Lignin, 483
Liverworts, 603
Lolium perenne (ryegrass), 87
Low-temperature scanning electron microscope, 135
Malaysia, 297
Mapping (modelling), 661
Maternal effects, 77
Maternal gender phenotypes, 77
Melilotus segetalis (annual sweetclover), 565
Microclimate, 271
Micro-scale, 327
Modern pollen, 327
Molecular genetics, 533
Moss polsters, 327
Multivariate statistics, 327

Mycorrhiza, 445
N_2 fixation, 383, 617
NADP-dependent glutamate dehydrogenase, 289
Nardus stricta, 391
N-assimilation, 289
Necrosis, 453
Needle, 235
Nitrate, 313, 391
Nitrite uptake, 313
Nitrogen, 383
Nodal roots, 575
Norway spruce (*Picea abies*, Pinaceae), 661
Nostoc, 617
N-regulation, 289
Nutrient accumulation, 87
Nutrient acquisition, 565
Nutrient cycling, 435, 445
Nutrient supply, 403
$O_2^{\cdot-}/H_2O_2$ scavenging enzymes, 361
O_3, 653
Open-air fumigation, 653
Organic phosphorus, 435, 445
Orientation with respect to gravity, 281
Ozone, 135, 483, 493
Ozone injury, 271
Ozone sensitivity, 145
P flux, 583
P inflow, 583
(Partial) male sterility, 67
Phaseolus vulgaris L., 281
Phialocephala fortinii, 259
Phloem loading, 47
Phosphodiesterase, 435
Phosphodiesters, 445
Phosphorus, 281, 307, 383
Phosphorus nutrition, 435, 445
Phosphorus storage, 97
Phosphorus translocation, 575
Photobiont, 627
Photosynthesis, 425, 453, 627
Photosynthetic capacity, 641
Physics of stomata, 235
Phytoalexins, 1
Phytoremediation, 113
Pinus sylvestris L. (Scots pine), 503
Pinus sylvestris (Scots pine) seedlings, 247
Pinus taeda (loblolly pine), 483
Plant defence mechanisms, 1
Plantago coronopus, 67
Plantago major, 493
Planting density, 103
Plasmodesmata, 603
Pollen, 343
Pollen analysis, 155
Populations, 493
Portulaca oleracea L. (purslane), 103
Proanthocyanidins, 483
Pteridium aquilinum, 119
P-use efficiency, 425
Quantitative image analysis, 471
Rain forest, 297
Reproduction, 317
Resource allocation, 493
Rhizocarpon geographicum, 123
Root growth angle, 281
Root respiration, 375
Salinity, 565
Salt adaptation, 317
Salt tolerance, 513
Seed and seedling physiology, 77
Signal transduction, 1
Snowdonia, 343
SO_2, 653
Sorghum bicolor, 317, 361
Spatial variation, 459
Species specificity, 119
Sporisorium amphilophis (floral-smut), 459
Spray inoculation, 119
SST, 555
Stagonospora pteridiicola, 119
Stomatal aperture, 135
Stomatal conductance, 425
Stomatal responses, 145
Sugars, 57
Sulphur dioxide, 503
Tapirira obtusa (Benth.) Mitchell, 97
Taraxacum officinale, 63
Tetracladium marchalianum, 593
Thlaspi caerulescens, 113
Thymelaea hirsuta, 77
Tillering, 87
Tissue phosphorus, 413
Translocation of radiocaesium, 471
Transpiration stream, 575
Trees, 203
Trifolium repens (white clover), 575
Trifolium subterraneum, 271
Ultrastructure, 145, 641
u.v.-B irradiation and flavonoid localization; Chalcone synthase, 247
Vascular architecture, 575
Vegetation, 343
Vegetation history, 171
Water stress, 57
Water-conducting cells, 603
Weed, 103
Western Isles, 171
Wheat, 57
Wood, 203
Woodland, 171
X-ray microanalysis, 135, 513
Xylem embolism, 47
Xylem recovery, 47
Zinc, 113
Zonation, 155